

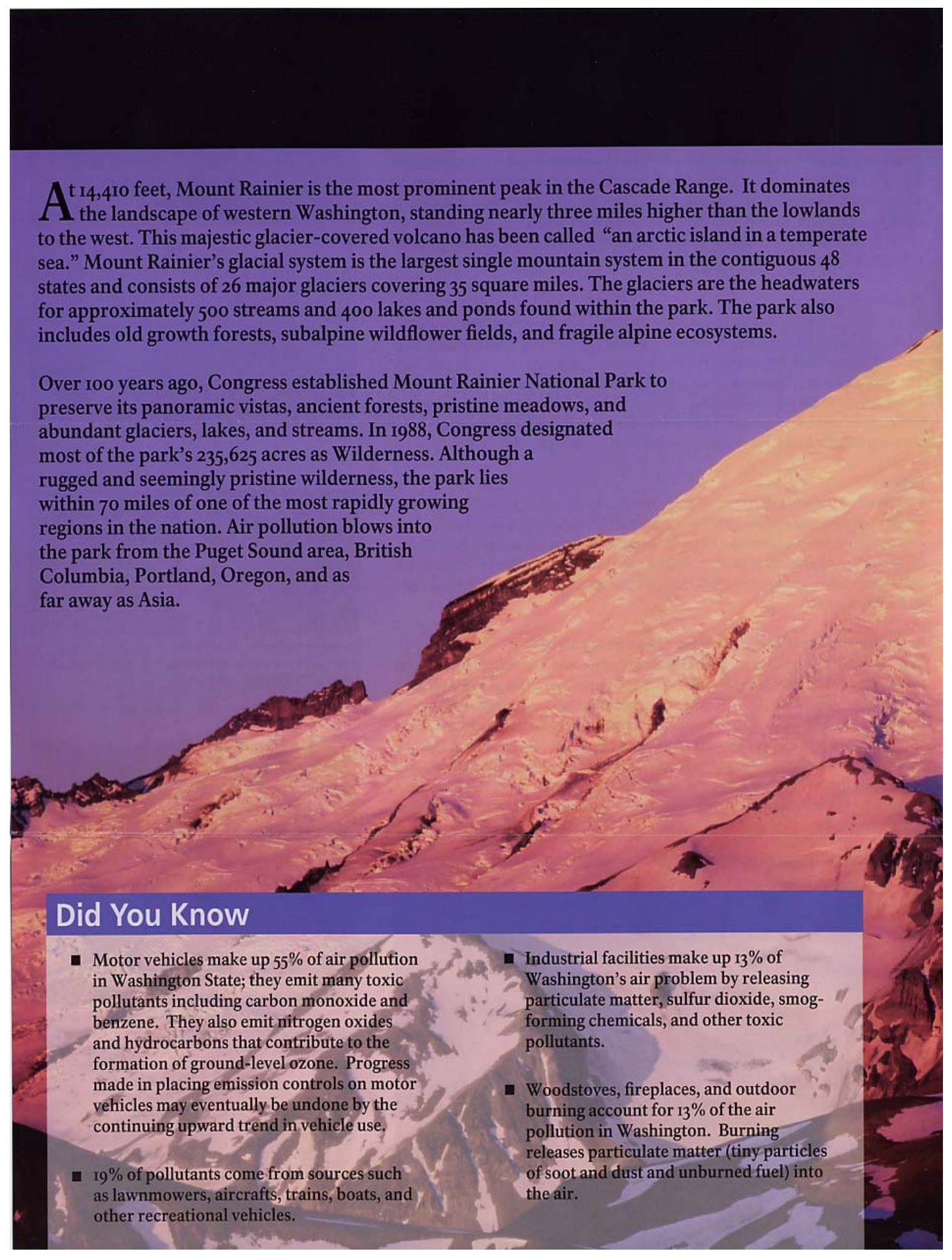
Mount Rainier National Park



Up In The Air



Although air quality is improving in much of the state, there are many days when Mount Rainier cannot be seen because of pollution caused by motor vehicles, some industries, and wood burning. Not only does air pollution decrease the scenic views, it can also injure natural resources.



At 14,410 feet, Mount Rainier is the most prominent peak in the Cascade Range. It dominates the landscape of western Washington, standing nearly three miles higher than the lowlands to the west. This majestic glacier-covered volcano has been called “an arctic island in a temperate sea.” Mount Rainier’s glacial system is the largest single mountain system in the contiguous 48 states and consists of 26 major glaciers covering 35 square miles. The glaciers are the headwaters for approximately 500 streams and 400 lakes and ponds found within the park. The park also includes old growth forests, subalpine wildflower fields, and fragile alpine ecosystems.

Over 100 years ago, Congress established Mount Rainier National Park to preserve its panoramic vistas, ancient forests, pristine meadows, and abundant glaciers, lakes, and streams. In 1988, Congress designated most of the park’s 235,625 acres as Wilderness. Although a rugged and seemingly pristine wilderness, the park lies within 70 miles of one of the most rapidly growing regions in the nation. Air pollution blows into the park from the Puget Sound area, British Columbia, Portland, Oregon, and as far away as Asia.

Did You Know

- Motor vehicles make up 55% of air pollution in Washington State; they emit many toxic pollutants including carbon monoxide and benzene. They also emit nitrogen oxides and hydrocarbons that contribute to the formation of ground-level ozone. Progress made in placing emission controls on motor vehicles may eventually be undone by the continuing upward trend in vehicle use.
- 19% of pollutants come from sources such as lawnmowers, aircrafts, trains, boats, and other recreational vehicles.
- Industrial facilities make up 13% of Washington’s air problem by releasing particulate matter, sulfur dioxide, smog-forming chemicals, and other toxic pollutants.
- Woodstoves, fireplaces, and outdoor burning account for 13% of the air pollution in Washington. Burning releases particulate matter (tiny particles of soot and dust and unburned fuel) into the air.



Air quality monitoring station



Monitoring Ozone

The Clean Air Act

In 1977, Congress amended the Clean Air Act to protect and enhance the nation's air quality and related values such as scenic vistas and natural ecosystems. The 1977 Clean Air Act Amendments designate many national parks and wilderness areas as "Class I Areas", which receive the highest degree of protection from the effects of air pollution. Mount Rainier National Park is a Class I Area.

Where Does Mount Rainier's Air Pollution Come From?

Air pollution at Mount Rainier comes from a variety of places and sources, depending on the air currents. The Seattle metropolitan area, Portland, and British Columbia are nearby sources, but pollutants also come from other parts of the U.S. and the world.

Studying Air Quality

We monitor air quality in the park to increase our understanding of how pollutants affect park resources. The park's air quality monitoring program includes data collection systems for studying visibility, acid deposition, ozone pollution, and air toxics:

- The chemistry of precipitation and snow is measured at high elevations where cloudwater samples have shown some of the highest levels of acidity in the state.
- Glaciers and lake ecosystems are studied to measure the effects of contaminants, nitrogen and sulfur on aquatic species and water chemistry.
- Ozone and visibility monitoring instruments measure air quality levels in the park. Ozone levels in the park are high enough to cause harm to plant growth. Scenic views are seriously impaired during some times of the year.

Up in the Air

The air we breathe is a mixture of gases, mostly nitrogen and oxygen. Oxygen is essential for life. Gases such as argon, carbon dioxide, and water vapor are also present. Human activities have added many other chemicals such as nitrogen oxides, hydrocarbons, carbon monoxide, ozone, particulate matter, and additional carbon dioxide.

POLLUTANTS	SOURCES	HUMAN HEALTH EFFECTS	ENVIRONMENTAL EFFECTS
Hydrocarbons	Produced by combustion of emitted vapors from fuels, paint, dry cleaning, oil and gas production/refining.	Can be toxic and carcinogenic.	Plays a primary role in the formation of ozone.
Ozone (O ₃)	Formed when nitrogen oxides and hydrocarbons react in the presence of sunlight.	Irritates lungs; may cause coughing, sinus inflammation, chest pains, and stinging eyes.	Damages leaves and needles; reduces plant growth, reproduction, and energy storage. Animals maybe affected in the same way as humans.
Sulfur Dioxide (SO ₂)	Oil refineries, smelters, incinerators, power plants, home heating units, and volcanoes.	Blocks breathing passages, increasing instances and severity of lung disease.	Reduces visibility, damages vegetation, forms acid rain as it's transported in the air, and harms aquatic ecosystems.
Nitrogen Oxides (NO and NO ₂)	High-temperature combustion from automobiles, industry, and power plants.	Irritates lungs, eyes, nose, throat, and skin. Can be fatal in high concentrations.	Reduces visibility, forms ozone and acid rain as it reacts with other chemicals in the atmosphere, stunts plant growth, damages aquatic ecosystems and species such as fish, amphibians, and invertebrates.
Carbon Monoxide (CO)	Automobiles contribute the majority found in urban areas. Forest fires can produce temporary high levels.	Attaches to red blood cells when inhaled, preventing them from absorbing oxygen. People with heart and lung problems are especially susceptible.	Possibly affects animals who inhale it in the same way as it does humans.
Particulates (solid particles and liquid droplets)	Wood-burning stoves, outdoor burning, construction, smelters, mining, farming, industry, forest fires, wind storms, and volcanoes.	Throat irritation, worsens heart and respiratory problems, and can carry compounds and heavy metals into lungs.	Reduces visibility, interferes with photosynthesis, and may alter climate. Heavy metals and organochlorines may be toxic to animals.
Air Toxics (persistent organic pollutants and heavy metals)	Factories, refineries, power plants, pesticides, insecticides, mobile sources, and forest fires.	Includes impacts on reproductive success, growth, behavior, disease, and survival.	Accumulate and persist in the environment, are carried through the food web, and concentrate in animals higher in the food chain.

The Effects of Air Pollution in Mount Rainier National Park

Visibility Impairment

Nearly two million visitors come to Mount Rainier each year to enjoy the scenery, but the view is often obscured by regional haze, especially in the summer. Haze is caused when sunlight encounters fine pollution particles in the air. Some light is absorbed by particles. Other light is scattered away before it reaches an observer. More pollutants result in more absorption and scattering of light, which reduce the clarity and color of what we see.

Acid Deposition

As precipitation water passes through the air it reacts with carbon dioxide, sulfur oxides, and nitrogen oxides to form acids. These compounds then fall to the Earth in either dry form (such as gas and particles) or wet form (such as rain, snow, and fog). The park's lakes and streams are very sensitive to acidic deposition because the soils and bedrock cannot neutralize acids well. Acid deposition impacts aquatic organisms and ecosystems as well as terrestrial life through direct contact and by changing the chemical balance in the soil and increasing the acidity of lakes and streams.

Ozone

Plants can be sensitive to ozone at levels well under the national health standards. Lichens, mosses and liverworts often are the most sensitive component of the vegetation within an ecosystem and can serve as early indicators of air pollution effects. Plants such as trees, shrubs, and herbaceous species are also injured by ozone which can damage leaves and needles and weaken the plants' ability to withstand disease and insect infestations.

Air Toxics (Persistent Organic Pollutants and Heavy Metals)

Recent studies indicate that air pollutants from Europe and Asia remain airborne for thousands of miles across the Pacific Ocean and deposit in snow at relatively high elevations in North America. Air toxics also originate from local and regional sources. These contaminants such as DDT, dioxin and mercury, may accumulate in annual snow-pack, particularly in higher elevation ecosystems. Once deposited, many pollutants, particularly persistent organic pollutants, accumulate and concentrate in foodwebs, threatening the viability of aquatic and terrestrial ecosystems. These air toxics are of particular concern because they remain in the environment a long time, can accumulate in the biological tissue of organisms, and are toxic to humans and wildlife.

You Can Help Improve Air Quality in Mount Rainier National Park

- Bicycle, walk, or take public transportation.
- Buy a fuel efficient automobile, tune up your car, combine errands and shop close to home with a friend, avoid wasteful idling, use radial tires and keep them properly inflated, carpool; avoid using gasoline-powered lawn and garden equipment.
- Don't make unnecessary fires in your wood stove or fireplace; replace uncertified (pre-1988) wood stoves with cleaner, more efficient EPA-certified wood or pellet stoves or switch to natural gas or propane. Avoid outdoor burning; compost or chip yard waste instead.

For more information: <http://www2.nature.nps.gov/ard/>
<http://www.pscleanair.org>
<http://www2.nature.nps.gov/ard/parks/mora/moracam/moracam.htm>



Photographs are used to record changes in visibility.



Damage to a healthy lupine plant contrasted with one damaged by ozone, as documented in fumigation studies. Lupines are common in the park.



Park lakes are monitored to determine the effects of air pollution on aquatic ecosystems.



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Mount Rainier National Park

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